DOCUMENT RESUME

ED 443 833 TM 031 315

AUTHOR Camburn, Eric; Correnti, Richard; Taylor, James
TITLE Using Qualitative Techniques To Assess the Validity of Teachers' Responses to Survey Items.
SPONS AGENCY Department of Education, Washington, DC.; National Science Foundation, Arlington, VA.
PUB DATE 2000-04-00
NOTE 34p.; Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, LA, April 24-28, 2000).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Elementary Education; Elementary School Teachers; Interviews; Language Arts; Mathematics; *Protocol Analysis; *Qualitative Research; Research Methodology; *Responses; *Teacher Surveys; *Teachers; *Validity

ABSTRACT

This paper presents the results of qualitative analyses that were designed to assess the validity of teachers' responses to items that measure topic coverage in mathematics and language arts. Using data from 12 "think-aloud" interviews and drawing on psychological theory about how respondents answer survey items, this research explored a number of ways that qualitative techniques can be used to diagnose and improve survey instruments in educational research. Twelve elementary school teachers in a midwestern U.S. city participated. Teachers were asked to report the mathematics and language topics they taught in a single day (unprompted report) and to chose the topics they had taught from a topic list. The contextual information teachers used in reporting topic coverage and teachers' understanding of reading topics were studied through the think-aloud interviews. Results suggest that teachers rely on a rich set of contextual information when recalling what they covered. Presenting teachers with the stimulus of a topic list triggered thoughts of content, whereas the open-ended nature of the unprompted report triggered the recall of other types of information. Results also show that teachers' understanding of the topics in topic lists cannot be taken for granted. Appendixes contain the reading and mathematics topic lists and an analysis of each teacher's understanding of two reading topics. (SLD)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 443 833

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)
✓ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Using Qualitative Techniques to Assess the Validity of Teachers' Responses to Survey Items

Eric Camburn, Richard Correnti, and James Taylor

University of Michigan

This paper was presented at the annual meeting of the American Educational Research Association, New Orleans, LA, April, 2000. The research reported herein was conducted as part of the *Study of Instructional Improvement* which is supported by the U.S. Department of Education, the National Science Foundation, and several private funders. The authors wish to acknowledge the efforts of Deborah Ball, Geoff Phelps, and Raven Wallace at the University of Michigan who, along with Eric Camburn, developed the instruments used for this research. We also wish to thank Sally Atkins-Burnett at the University of Michigan for her review of various analyses and for her advice on an earlier draft. Please address correspondence to: Eric Camburn, University of Michigan, School of Education, 610 East University, Room 3112A, Ann Arbor, MI 48109.

TM031315

BEST COPY AVAILABLE

Overview

This paper presents the results of qualitative analyses that were designed to assess the validity of teachers' responses to items that measure topic coverage in math and language arts. Using data from 12 "thinkaloud" interviews, and drawing upon psychological theory on how respondents respond to survey items, this research explores a number of ways that qualitative techniques can be used to diagnose and improve survey instruments in educational research.

Theoretical perspectives

Teachers' reports of academic content coverage are considered by many to be a fundamental educational process variable that is indicative of student opportunity to learn (OTL). Given the widespread use of OTL measures as educational process indicators, and more recently as indicators of whether standards are being met, understanding the validity of such measures has important implications for policy and practice. Recent attempts to validate teachers' reports of content coverage suggest that on average, teachers can recall topics they taught with about 75 percent accuracy (Porter et al, 1993; Burstein et al, 1995). Researchers in the latter study found that recall accuracy varied considerably by topic and believed that teachers' understanding of topic labels (or lack thereof) was a key source of this variation. Beyond general measures of response accuracy examined in studies like these, little is known about how teachers interpret content coverage items or how they formulate answers to such questions. Drawing upon psychological theory of the survey response process, this paper investigates how qualitative "thinkaloud" protocols and corresponding analytic techniques can be used to assess how teachers interpret and respond to content coverage items. In doing so, the paper examines the use of qualitative techniques as tools for diagnosing the validity of

survey items and discusses the implications of using such techniques for future surveys of instructional practice.

The cognitive task of answering content coverage items

Our theoretical and analytical perspectives in this paper are heavily colored by assumptions we make about the cognitive tasks required of teachers when they answer content coverage items. We believe that content coverage items engage teachers in a uniquely complex task. Such items begin with a list of topics that are thought to encompass some portion of a curriculum, that has been developed in a particular academic subject, for students of a particular age or grade.[1] For example, the OTL items from the *Prospects Classroom Teacher Questionnaire* are thought to encompass the language arts and the mathematics curriculum for elementary grade students. There is a great deal of variation in the specificity and the comprehensiveness of topic lists. Whereas the math topic list for the *Prospects Classroom Teacher Questionnaire* contains 10 topics, including a single topic for "geometry", the math topic list for the *TIMSS Population I Teacher Questionnaire* contains 36 topics, including five geometry topics such as "perimeter, area and volume", and "congruence and similarity." Despite the variation in the their length and specificity, topic lists are significantly longer than the four, five and six-point rating scales that are the hallmark of many questionnaires. Moreover, the language used to describe topics is often quite complex and replete with technical terms.

This characterization reinforces the notion that answering content coverage items is a very complex cognitive task. Such items require teachers to formulate a summary judgement of considerable complexity by having them reflect back over multiple days of

[1] In charting out the tasks required of teachers in responding to content coverage items, teacher questionnaires from the following recent surveys of elementary school teachers were reviewed: Prospects,

instruction, across a multitude of different lessons in which a variety of techniques were used with a wide array of student configurations, and then requiring them to select a subset of topics from a list that may contain 30 or more different choices. This paper attempts to unpack the ways in which teachers interpret and process through this complexity and to investigate how such processing affects teachers' responses to content coverage items.

Sources of evidence and analytic approach

Data used for this paper come from interviews conducted with 12 elementary school teachers in a small Midwestern U.S. city. The interviews were conducted as part of a pilot of a self-administered questionnaire called the *Instruction Log* that captures daily reports of teachers' instruction. This work is part of a larger program of research called the *Study of Instructional Improvement* which is a longitudinal study housed at the University of Michigan that will examine the improvement efforts of 125 schools over the next six years.

The interviews utilized "thinkaloud" techniques, sometimes referred to as cognitive interviews, where respondents verbalize their thinking processes as they answer interviewers' questions or questionnaire items. Thinkalouds and related techniques have become increasingly accepted as a useful way to improve questionnaire items by examining respondents' cognitive processes (see Sudman, Bradburn, and Schwarz 1996, for an overview and Schwarz and Sudman, 1995 for a more in depth discussion of these techniques). The cognitive interviews conducted for this study have been transcribed and analyses were conducted by coding and systematically evaluating transcripts using QSR's NVivo program.

TIMSS, Reform Up Close, the U.S. Elementary Reading Instruction Survey, Congress to the Classroom, and recent studies conducted by the Consortium on Chicago School Research.

The interviews used for this paper engaged teachers in two tasks: 1) an *unprompted report* of topics taught in a single school day, and 2) *choosing the math and reading topics they taught from a topic list*. In the *unprompted report* section, respondents were asked to report the math and language arts topics their students worked on during the school day immediately prior to the interview. Participants were asked to "think aloud" as they recalled topics, sharing their thought processes as they remembered what they had taught. Teachers' responses during this unprompted report yielded evidence of how teachers defined specific curricular topics. The unprompted report also illuminated various kinds of contextual clues teachers used to aid their recall such as instructional activities, routines, and materials used.

In the *choosing topics taught* section of the interview, teachers were shown lists of math and language arts topics that had been developed for the daily *Instruction Log*. The topic lists, which are presented in Appendix A, are similar to those used in recent national surveys of elementary school teachers such as Prospects and TIMSS. Going through a record of their day they had had compiled with interviewers, teachers were asked to choose topics on our topic lists that corresponded to the topics contained in their record. Again using a thinkaloud approach, participants were encouraged to verbalize their thinking as they located their topics on the lists and to report any difficulties they encountered in making this translation. This section of the interview yielded additional evidence of how teachers conceive of specific curricular topics.

In analyzing the results, the authors read each of the interviews and identified a number of reoccurring themes. A set of codes based on these themes was developed by the investigators. Transcripts that were coded according to this coding scheme served as the primary database that was examined for this paper.

A variety of techniques were used to analyze the interview data. Character and passage counts and paragraph markers were examined to gain a general picture of the relative emphasis placed on different context clues. Looking across teachers, transcript sections that were assigned the same code were re-read to identify sub-themes and to develop fuller explanations of issues that emerged. The degree of agreement between teachers' and investigators' definitions of two key reading topics was assessed and coded. In presenting the results below, a number of extended transcript passages are provided to illustrate particular themes. Methods of data manipulation and analysis are explained in further detail below within the context of the analyses for which they were used.

The remainder of this paper is devoted to presenting the results of two empirical analyses: one which examines the contextual information on which teachers draw when reporting topic coverage, and another which investigates teachers' understanding of reading topics.

Contextual information on which teachers draw when reporting topic coverage

This first set of analyses documents the contextual information and cues teachers draw upon to remember the content their students work on. Recalling previously taught topics requires teachers to access autobiographical memory. Some psychologists believe that autobiographical memory is partially organized in terms of meanings that are attached to events as they are comprehended. In recalling an autobiographical event, individuals search among memories that have been encoded with similar meaning. This model of autobiographical memory suggests that recall will be better when questions cause respondents to remember information in a way that taps the way in which the information was originally encoded. OTL items typically require teachers to report on their content coverage without reference to contextual clues such as the activities in which students engaged when they worked on the topic or the materials that were used.

Reporting on content covered in this kind of decontextualized manner may create an unnatural response task that makes OTL items difficult to answer. Making reference to the context in which a topic was taught might in turn aid teachers' recall.

This first analysis primarily focuses on teachers' interpretation of the word "topic", a pivotal term which is contained in the stem of many content coverage items. In the unprompted topic report section of the interview teachers were asked the following question:

> I would like you to spend just a few brief minutes to tell me what math and what reading/writing topics you taught to students today.

In responding, teachers were encouraged to thinkaloud. They did not receive any prompting from the interviewer and were not given a topic list as a reference point. In this sense, this section of the interview simulates what one might observe if a teacher were asked just the stem of a typical content coverage item and not presented with the long list of topic response choices.

Our analysis of teachers' transcripts indicated that explicit reports of topic coverage tended to be surrounded by substantial contextual information. Table 1 illustrates that when directly asked to report the math and reading topics they had taught that day, most teachers did not explicitly mention a topic until well over half way through the unprompted report section of the interview. Perusal of the transcripts revealed that before they explicitly mentioned a topic, most teachers provided a rich contextual background about their teaching of the topic.

Table 1: Percent of interview that took place prior to the first explicit mention of a reading or mathematics topic

Teacher ID	Number of paragraphs in transcript	Paragraph in which topic is first explicitly mentioned	Percent of interview prior to first explicit topic mention
10	54	11	20%
01	64	31	48%
04	36	19	53%
08	12	7	58%
06	32	19	59%
05	55	34	62%
12	16	15	94%
02	20	19	95%
09	20	19	95%
11	28	27	96%
03	19	19	100%
Overall	32	20	62%

When they did finally make explicit mention of a math or a reading topic, these mentions were relatively brief compared to teachers' descriptions of other contextual factors. As Table 2 illustrates, the average teacher spent about eleven percent of the interview explicitly discussing content coverage.

Table 2: Percent of transcript text (measured in text characters) devoted to explicit discussion of academic content

Teacher ID	Percent of transcript text devoted to explicit discussion of topic
05	3%
10	4%
03	5%
09	8%
06	11%
04	11%
01	12%
12	15%
11	18%
08	20%
02	29%
Overall	11%

When not explicitly discussing topics, teachers' reports were focused on contextual factors that seemed to help them recall topics that were taught. In many cases it also seemed that recalling the contextual information was intended to help the interviewer understand what teachers did in their classrooms that day. Our analysis of teachers' transcripts revealed five contextual factors that were particularly prominent in teachers' descriptions: routines, instructional activity, students, materials, and aides or other teachers. The number of times each of these factors was mentioned is shown in Table 3. In order to portray its relative emphasis by teachers, the number of times academic topics were explicitly mentioned is also included in Table 3.

Table 3: Contextual factors mentioned in topic unprompted topic reports

Contextual factor	Number of Times Factor Mentioned	Percent of times Factor Mentioned
Routines	42	12%
Instructional activity	156	44%
Students	43	12%
Materials	30	9%
Aides/other teachers	9	3%
Academic content	72	20%
Total	352	100%

By far, the factor given the greatest prominence in teachers' unprompted reports of topics was instructional activity. Instructional activity includes the academic tasks in which students engage and the different ways in which teachers and students interact in the classroom. Although instructional activity necessarily focuses on academic content, teachers' descriptions of instructional activity focused mostly on what they and their students did, rather than what they were studying. But it is precisely because instructional activities always focus on content that relying on instructional activity as a guidepost for recalling topics taught seemed particularly useful to teachers. If teachers

were able to remember what they and their students did, it seemed easier for them to reconstruct the academic content they taught. Consider the following excerpt from Teacher 09's transcript in which she talks about her topic focus in math within the context of the day's activities.

> Teacher 09: And then we went to math again. We did a "Mad Minute," fifty multiplication problems. I just yell out the times, one minute, two minutes, three minutes, so kids can time themselves and figure out what they can do to challenge themselves, if they need to get down to three minutes or down to two minutes or down to one minute, but everybody finishes the problems, and then we just flipped the paper over and worked on a few multiplication problems, two by one, two digits by one digit. ...And then today's computational math problems, multiplication, division and adding , subtracting multiplying and dividing fractions. And we worked on those. A small group of kids came up to the board, and we worked on dividing fractions for a while.

Students and materials also seemed to provide useful guideposts for teachers. Recalling what they did with particular students or what materials they were using seemed to help some teachers reconstruct what academic content they focused on during the day.

> Teacher 02: Okay, they had a choice time at the beginning of the day and there was a bingo game out that had sight boards, so some of them were working on sight boards. Some of them were drawing and writing of their own choice. Some were doing activities on the computer and whatever they choose to do on the computer in the morning, they have free choice. Others were using some Geo blocks and building cities and whatever they happened to choose to build;

A considerable number of teachers relied upon instructional routines to aid their recall. It is well documented that teachers use a variety of routines, that occur with varying periodicity, to organize classroom instruction. In a number of cases, teachers appeared to use routines as markers to initially orient themselves. For example, this teacher began her report of topic coverage with a description of reading instruction on a typical day.

> Interviewer: First of all, what I'd like to do is just have you take a few minutes to talk to me about what kind of math and reading and writing topics the students worked on today.

> Teacher 04: Today? Okay. In terms of reading, I do have a regular reading time, so that's easier to remember, I'll start with that. Right after lunch is an independent reading time, and they all read individually, and I often read…that's when I do most of my reading instruction. I'll take one or two kids and read with them one to one. And while I read with them one to one, it varies a lot as to what they're working on. …Let's see, as I'm reading, so many of them are reading quite well now, so we hit, we might hit a little bit of phonics as we're reading along, but mostly we just do a lot of reading for general meaning and trying to put it all together.

Once oriented by their routines, it seemed that a number of teachers could more easily establish what happened on the day we interviewed them.

> Teacher 01: Ok…So, everyday we have a snack and story time. And the children share a snack together and we read out loud to them from a story often related to a theme, in this case to our mathematics. We're doing some geometry, and we have a story ah… about a quilt that we read out loud. And so the topic at that point, now I have to start thinking about your reading topics in your list… I read out loud to them everyday, and for a variety of purposes. In this case it was to enhance the theme, its practice that… for them for listening, its vocabulary development.

The results of this first set of analyses suggest two things: 1) that when recalling topics, teachers seem to pay attention to features of classroom life that are salient to them and that help orient them, 2) academic content does not appear to be a primary organizer for many teachers' conceptions of their instruction. These results suggests that content coverage items might be improved if survey designers gave greater consideration to the ways in which teachers appear to think about academic content.

Teachers' understanding of reading topics

The second set of analyses dealt with teachers' understanding of two key topics in the reading topic list. Our goal here was not to validate every topic on the lists, but rather, to probe the efficacy of different techniques that survey researchers might use to more generally validate respondents' understanding of questionnaire items.

Methodologists who study how individuals respond to survey items generally agree that the first step in answering an item is to understand its meaning. Research has shown that "lexical ambiguity", which occurs when words potentially take on more than

one meaning for a respondent, is a common problem in question comprehension. Lexical ambiguities are inherent in everyday language. One reason for this is that alternative meanings of the same word may be differentially accessible to different people because of the frequency with which they use or encounter the word. Lexical ambiguity can also result when words take on different meanings within different groups and subcultures. Ambiguous meaning is a clear threat to valid measurement since the validity of a response is dependent on respondents sharing researchers' understanding of an item's meaning.

Because of their heavy reliance upon technical terms, content coverage items may be particularly prone to problems associated with lexical ambiguity. One potential problem is that teachers may simply be unfamiliar with terms used in topic lists. This conjecture has some grounding in empirical results as Burstein et al (1995) found a number of teachers did not understand what "proportional reasoning" and "math modeling" meant even though these topics appeared in key math reform documents to which teachers' had likely been exposed. Another common problem, also observed by Burstein et al (1995) arises when a topic can be thought of both as abstract knowledge within a content domain and as a strategy that can be used to learn abstract knowledge within a domain. For example, "making inferences from data" can either be the substantive focus of a math lesson or can be a strategy that students use to work on other mathematical topics.

The validity of teachers' topic reports was assessed by comparing teachers' understanding of two key reading topics with those of the investigators. Following are the investigators' definitions of the two topics:

> *Sight words (topic 1.2.03): Sight words* are words that students are to quickly recognize and read without needing to decode them. They typically include very common words (i.e. then, it, help), or words that are very difficult to sound out

using conventional phonetic rules (i.e. have, the, some). Typical ways in which teachers work with *sight words* are: word walls, flash cards, and word lists.

Word reading strategies (topic 1.2.06): This topic encompasses a number of specific strategies that students use to read words including: the use of pictures or other context cues, and paying attention to specific characteristics of words such as the initial consonant, rhyming, and common word endings.

The analyses were conducted in two steps. First, teachers' conceptions of the two key reading topics were ascertained by analyzing teachers' descriptions of their reading instruction for a single day. These descriptions were gleaned from transcripts of the *unprompted report* section, and teachers' topic reports were taken from the *choosing topics taught* section of the interview. In the second step of the analysis, teachers' conceptions of the topics were compared to those of the investigators and each topic report was placed into one of the following categories:

- *Teachers' conception is consistent with researchers'*. Topic reports were assigned to this category when teachers' descriptions of classroom activity or content covered indicated their understanding of the topic was the same or very similar to the above topic definitions.
- *Teachers' conception is inconsistent with researchers'*. Topic reports were assigned to this category when teachers' descriptions of classroom activity or content covered indicated that their understanding of a topic differed substantially from the topic definitions listed above.
- *Unable to determine teachers' conception of topic*. Topic reports were assigned to this category when teachers' description of classroom activity or content covered provided inconclusive evidence about whether the teacher shared the researchers' understanding of a topic.

Overall, only one teacher expressed an understanding of a topic that was clearly different from the investigators' definition. The degree to which teachers and researchers possessed the same understandings varied by topic. Teachers' descriptions of instruction that focused on *sight words* were highly consistent with the investigators' definition of that topic. In comparison, teachers' reports of teaching *word reading strategies* were more equivocal, and thus, it was more difficult to judge the degree to which teachers shared researchers' definition of that topic. The results of the analysis of teachers'

descriptions of teaching *sight words* and *word reading strategies* are summarized in Table 4. Excerpts from interview transcripts, which detail teachers' understanding of the two topics, and justifications for the classification of each teachers' topic reports can be found in Appendix B.

Table 4: Summary of the validation of teachers' reports of two reading topics

Topic	Teachers' conception was consistent with researchers'	Teachers conception was not consistent with researchers'	Unable to determine teachers' conception of topic
Sight words	6	0	2
Word reading strategies	3	1	6

Sight words

Among the twelve teachers who reported on a single day of their instruction, the topic *sight words* was mentioned a total of eight times. In six of the eight cases, teachers' descriptions of their instruction indicated that their conception of the *sight words* topic was consistent with the investigators' definition. Consistent reports were associated with a variety of instructional activities at a number of grade levels. For example, a K-1 teacher worked with her students on *sight words* that were contained in books they had chosen themselves:

> *Teacher 01:* Today... we read from trade books, so they're choosing books. I have books that are graded from pre-primers through chapter books. Today, I worked with two or three kids that are still just getting the first like hundred *sight words*... So these are books... that have 64 words in them. I pull them out for the kids that don't seem to think they can read books, but are learning all the *sight words* and everything else but that.

Another primary-grade teacher had her students work on *sight words* while they played a game:

> *Teacher 02:* And after lunch, they were working with *sight words*; they were playing some games with them. We play a game where there are words, words like "the sun" located on my wall too, and we play a game where "Guess my word?" and I'll say something like "Well, it is on the wall" and "Well, it begins with the letter 'L' " and I give them clues until they can finally come up with the word.

One of the more interesting reports came from a third grade teacher who was not working on *sight words* with her own students, but whose students were helping to teach kindergarten students how to read. The teacher reported that she trained her students how to work on *sight words* and various other reading skills with the kindergarten students.

In two cases, teachers simply reported that they worked on *sight words* with their students but did not provide any further elaboration of how the topic was taught. This meant that we were unable to determine whether the teachers' conception of *sight words* aligned with our own. As we discuss below, many teachers' reports of *word reading strategies* also lacked this kind of descriptive detail.

Word reading strategies

Work on *word reading strategies* was mentioned a total of ten times in the cognitive interviews. In three of the ten cases, teachers' descriptions of their instruction indicated that their understanding of *word reading strategies* was closely aligned with the investigators' definition. Perhaps the clearest example of this is the third grade teacher whose students helped teach kindergarten students how to read.[2]

> *Teacher 12:* My children were working with the kindergartners. We had given them a sort of mini-training so they were working with the kindergartners on how to figure out what a word is by looking at the picture. Not only by looking at the picture, but context clues and hints, and beginning letter sounds so a lot of these subcategories they were working not necessarily for themselves but to help the kindergartners pick it up. So I'd say print concepts 1.1.01. 1.1.02. 1.1.03. 1.2.01. 1.2.02. 1.2.03 *sight words*. Oh, wait. 1.2.06 *word reading strategies* like picture and context clues so they were pointing to pictures and having the kindergartners say "bicycle" so the word is "bicycle."

The degree to which teachers' understanding of this topic overlapped with our definition could not be determined in six of the ten cases. In nearly all of these cases, teachers claimed to work on *word reading strategies* with their students but did not

[2] It is interesting to note that under our current data collection plans for the *Instruction Log*, teacher 09's report of working on sight words and word reading strategies would be in error, because we currently ask teachers to report on specific students in their own classes. Since teacher 09's third graders were not

provide a sufficient description of their teaching to validate their claim. In many instances, teachers simply reported that they worked on the topic and said no more about the matter. However, the reports of a few teachers went a bit further because they included activities that could plausibly be associated with the coverage of *word reading strategies*. For example, teacher 05's report suggested that she was assessing students' ability to use *word reading strategies* in order to determine the appropriateness of books these students had chosen.

> *Interviewer:* What about the four children that you were reading with...
> *Teacher 05:* That I read with individually? I was looking for, I was looking for 1.2.02, I was looking for 1.2.03 and 1.2.06 in other words, if they wanted to continue reading the same kind of book we were reading, I need to make a decision if they were only going to become more frustrated or if I had to change what they were choosing.

One might reasonably infer from this scenario that teacher 05 covered *word reading strategies*. Despite this plausibility however, there was insufficient detail in teacher 05's transcript to determine whether she in fact shared our definition of this topic.

This analysis of teachers' reports of *word reading strategies* also revealed a topic omission. Teacher 02's interview clearly indicated that she worked on *word reading strategies* with her students but she did not report this topic. In order to fully capture omissions like this, one would need a different research design than that used for this study. Within the confines of the larger study of which this work is a part, we are undertaking a more comprehensive investigation in which the topic reports of approximately 30 teachers will be validated against classroom observations.

The techniques used for the second set of analyses seemed relatively useful in surfacing respondents' understanding of item response choices and in suggesting ways in which we might want to clarify our topic definitions. Despite our very limited scope, the

---

actually working on these two topics, her report would have been erroneous. This is an example of the kinds of issues that can be revealed when qualitative techniques are used to diagnose questionnaires.

evidence suggested that we can be quite confident that we understand what teachers did when they reported to us that they worked on *sight words*. The results for *word reading strategies* were much more equivocal however. We suspect that our results might reflect the ways in which the topics were defined. While there are many different ways to work on *sight words*, the topic is relatively unidimensional. That is not the case for *word reading strategies* which includes a number of different approaches to reading. A simple assertion that one worked on *sight words* is a fairly unambiguous (albeit general) indicator of what kind of instruction is taking place. A similar kind of assertion that *word reading strategies* took place is much more ambiguous as there are many more things wrapped up in that topic. More explicitly specifying the approaches that are included in *word reading strategies* might lead to less ambiguous responses.

The results also surfaced potential limitations of the interview protocol. Once teachers had chosen the topics they had taught from the lists, we could have probed for more explicit descriptions of each topic chosen. This might have helped resolve some of the ambiguity in teachers' reports of *word reading strategies*.

Discussion

Survey researchers often take for granted what respondents intend when they answer a question. In the case of student OTL items, one might assume that the topics one teaches are quite easily retrieved in a direct fashion. The results presented in this paper suggest that this is not the case, that instead, teachers are likely to draw on a rich set of contextual information when recalling what they covered. Without any stimuli to guide them, teachers relied on a variety of internally-generated guideposts to aid their recall. The presentation of topic lists seemed to focus teachers' thinking on content. One clear implication of this is that researchers interested in measuring content coverage would be highly advised to stick with topic lists, despite their limitations. It was clear

that presenting teachers with the stimulus of the list triggered teachers to think about the content they taught, whereas the open-ended nature of the unprompted report triggered the recall of a lot of other kinds of information. We would extend a more general cautionary note to survey researchers who are contemplating the use of open-ended questions.

Our findings further suggest that teachers' understanding of the topics in topic lists can not be taken for granted, and that if they really wish to be confident about the validity of teachers' responses to such items, researchers must explicitly investigate such matters. Opportunity for differences in understanding are particularly acute when the domain being measured is large, as it was in our case. While not a panacea, our findings suggest that investigating respondents' descriptions of what gets coded into response choices can affirm the validity of responses and highlight a variety of response problems.

The results of this research have also pushed us to think about how we might modify items to make them clearer and more intuitive to respondents. One avenue of improvement suggested by the results would be to intersperse questions that ask about instructional activity or some of the other guideposts used by teachers with content coverage items. Sudman et al (1996) suggest that the content of preceding questions can increase the accessibility of a concept in memory thus increasing the likelihood that this concept rather than another is used in resolving perceived ambiguities in a question's meaning. This suggests that it might be possible to contextualize content coverage items by preceding them with questions about instructional activity, routines, students, or materials.

We feel that the techniques described in this paper helped us understand our instrument better and believe these techniques may be a useful addition to the toolkits of survey researchers who wish to better understand the meaning of respondents' answers.

Working in this direction strikes us as an important matter since the meaning of survey results and the validity of inferences one can make from such results hinges upon respondent and investigator sharing an understanding of a question's meaning.

References

Burstein, L, McDonnell, L.M., Van Winkle, J., Ormseth, T.H., Mirocha, J., and Guiton, G. (1995). *Validating national curriculum indicators.* Report prepared for the National Science Foundation. Santa Monica, CA: RAND.

Miles, M.B, and Huberman, A.M. (1994). *Qualitative data analysis.* Thousand Oaks, CA: SAGE.

Porter, A.C., Kirst, M.W., Osthoff, E.J., Smithson, J.L., and Schneider, S.A. (1993). *Reform up close: An analysis of high school mathematics and science classrooms.* Final report to the National Science Foundation on Grant No. SPA-895346 to the Consortium for Policy Research in Education. Madison, WI: Wisconsin Center for Education Research.

Schwarz, N. and Sudman, S. (1995). *Answering questions.* San Francisco: Jossey-Bass.

Sudman, S., Bradburn, N.M., and Schwarz, N. (1996). *Thinking about answers: The application of cognitive processes to survey methodology.* San Francisco: Jossey-Bass.

Appendix A: Reading and Math Topic Lists

1. Reading Topics.

1.1 Pre-reading.

- 1.1.01 Print concepts (use and organization of text and books).
- 1.1.02 Phonemic awareness (hearing sounds, recognizing rhymes)
- 1.1.03 Language concepts (purpose of text: enjoyment, information)

1.2. Letter and word analysis / reading

- 1.2. 01 Letters/ sounds
- 1.2. 02 Phonemic knowledge and skill (sound out letter combinations and words, write letter combinations and words from sounds/ phonetic spelling)
- 1.2. 03 *Sight words* (recognize whole words)
- 1.2. 04 Conventional spelling
- 1.2. 05 Structural analysis of words (compound words, suffixes, roots, word families, syllabification)
- 1.2. 06 *Word reading strategies* (picture and context clues, initial consonant, common endings, compound words, read-stop-reread)

1.3. Reading comprehension

- 1.3. 01 Word meaning (vocabulary knowledge, relationship of word meanings--antonyms, synonyms, multiple meanings, etymologies)
- 1.3. 02 General comprehension strategies at the sentence and paragraph level (strategies for activating prior knowledge/ generating predictions; question answering strategies; strategies for checking comprehension)
- 1.3. 03 Structural analysis of text (identify main idea, character; recognize language patterns, rhyme)
- 1.3. 04 Literary conventions (imagery, symbolism, metaphor, point of view, fact/opinion, mood/tone, reality/fantasy)
- 1.3. 05 Literary forms (report, literary response, narrative, poetry, biography, fantasy, historical fiction)
- 1.3. 06 Read for a variety of purposes (for enjoyment, to learn content, to explore a question of interest)
- 1.3. 07 Listened for a variety of purposes (for enjoyment, to learn content, to explore a question of interest)

1.4. Written composition

- 1.4. 01 Grammatical and mechanical conventions (formation of letters, spacing between words, complete sentences, syntax)
- 1.4. 02 Beginning composition at the word and sentence level (understand that writing conveys meaning; label objects, ideas, feelings with words or sentences)
- 1.4. 03 Select topic and focus, generate and organize ideas.
- 1.4. 04 Identify audience, target writing to audience.
- 1.4. 05 Word choice (choose words to persuade or entertain; chose words for different written conventions and forms)
- 1.4. 06 Select and develop structural features of text (main idea, character development, language patterns, rhyme)
- 1.4. 07 Select and develop literary conventions (imagery, symbolism, metaphor, point of view; fact/opinion, mood/tone, reality/fantasy)
- 1.4. 08 Select and develop of literary forms (report, literary response, narrative, poetry, biography, fantasy, historical fiction)
- 1.4. 09 Proofread and edit written composition (spelling, punctuation, grammar; word choice, structural features of text, writing conventions)
- 1.4. 10 Student wrote for a variety of purposes (for enjoyment, to learn content, to explore a question of interest).

1.5. Study skills (use of dictionary, table of contents, glossary, index, encyclopedia).

Appendix A (continued)

2. Math Topics

2.1. Number and Operations

- 2.1. 01 Counting and number sense
- 2.1. 02 Read and recognize numbers
- 2.1. 03 Sets and classification
- 2.1. 04 Comparing, ordering
- 2.1. 05 Number concepts (e.g., even, odd, prime, composite)
- 2.1. 06 Grouping and place value
- 2.1. 07 Numeration
- 2.1. 08 Integers
- 2.1. 09 Fractions
- 2.1. 10 Decimals
- 2.1. 11 Addition concepts, basic combinations
- 2.1. 12 Subtraction concepts, basic combinations
- 2.1. 13 Multiplication concepts, basic combinations
- 2.1. 14 Division concepts, basic combinations
- 2.1. 15 Addition computation
- 2.1. 16 Subtraction computation
- 2.1. 17 Multiplication computation
- 2.1. 18 Division computation
- 2.1. 19 Factors, multiples, divisibility
- 2.1. 20 Ratio, proportion, percent
- 2.1. 21 Real numbers

2.2 Geometry

- 2.2. 01 Points, rays, lines, segments, planes
- 2.2. 02 Angles
- 2.2. 04 Symmetry
- 2.2. 05 Visualization, spatial reasoning
- 2.2. 06 Parallel, perpendicular
- 2.2 .07 Polygons (triangles, squares and rectangles, other quadrilaterals, other)
- 2.2. 08 Circles
- 2.2. 09 Coordinate geometry
- 2.2 .10 Similarity, congruence
- 2.2. 11 Symmetry
- 2.2. 12 Solid figures (spheres, pyramids, polyhedra)
- 2.2. 13 Transformations
- 2.2. 14 Pythagorean theorem

2.3. Measurement

- 2.3. 01 Non-standard measure
- 2.3. 02 Calendar
- 2.3 .03 Time
- 2.3. 04 Length
- 2.3 05 Perimeter
- 2.3. 06 Area
- 2.3. 07 Volume, capacity
- 2.3. 08 Angle
- 2.3 09 Weight
- 2.3. 10 Temperature
- 2.3. 11 Rates
- 2.3. 12 Convert measurement units
- 2.3. 13 Circumference

24 Probability

- 2.4 .01 Events, possible outcomes
- 2.4 .02 Equally likely
- 2.4 .03 Empirical probabilities
- 2.4 .04 Calculation of theoretical probabilities

2.5 Statistics

- 2.5. 01 Collecting and organizing data
- 2.5. 02 Mean, median, mode
- 2.5. 03 Sampling
- 2.5. 04 Draw conclusions from data
- 2.5. 05 Evaluate conclusions drawn from data
- 2.5. 06 Make inferences from data
- 2.5. 07 Describe, evaluate data
- 2.5. 08 Select data display
- 2.5. 09 Complete/construct data display
- 2.5. 10 Interpret data display
- 2.5. 11 Compare data
- 2.5. 12 Use data to solve problem

2.6 Patterns, Functions, and Algebra

- 2.6. 01 Patterns
- 2.6 . 02 Missing elements
- 2.6. 03 Variables
- 2.6 . 04 Functions
- 2.6 . 05 Equations
- 2.6. 06 Inequalities
- 2.6. 07 Graph linear problems
- 2.6. 08 Use algebra to solve problems

2.7. Exploration and problem solving

- 2.7. 01 Formulate problem
- 2.7. 02 Spatial reasoning
- 2.7. 03 Proportional reasoning
- 2.7. 04 Solve non-routine problem
- 2.7. 05 Deductive/inductive reasoning
- 2.7. 06 Identify missing/extra information
- 2.7. 07 Evaluate solution
- 2.7. 08 Evaluate conjectures
- 2.7. 09 Develop and explain strategy

28 Reasoning, Proof

- 2.8 .01 Investigate conjectures
- 2.8 .02 Develop/evaluate mathematical arguments and proofs
- 2.8 .03 Proving completeness of a solution
- 2.8. 04 Select/use various types of reasoning and methods of proofs

2 9 Communication

- 2.9 .01 Using and creating representations (drawings, graphs, concrete objects(
- 2.9 .02 Symbolic notation
- 2.9 .03 Using language to talk and write about mathematical ideas

Appendix B: Analysis of teachers' understanding of the reading topics *sight words* and *word reading strategies*

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 01, grades K & 1	*Teacher:* Today… we read from trade books, so they're choosing books. I have books that are graded from pre-primers through chapter books. [Students] independently choose unless I have a particular task for them in mind that day. Today, I worked with two or three kids that are still just getting the first like hundred *sight words*… They've been reading for confidence some limited vocabulary story books. In particular as I remember today, [they read] Margaret Helert stories. So these are books… that have 64 words in them. I pull them out for the kids that don't seem to think they can read books, but are learning all the *sight words* and everything else but that. *Teacher:* So the group of kids… that were reading from the limited vocabulary books, I don't know if we want to call that *sight words*. My goal wasn't necessarily for them to practice the *sight words* as much as it was for their attitude about books as we talked about already, and their sense of… "Oh, I can do the whole book!" But they did that by practicing the *sight words* that there in these books. So there is a topic that says *sight words*… *Interviewer:* So I'll put that down. 1.2.03 Ok… *Teacher:* This is one of the one's too that we were talking about, *word reading strategies*. …integrating different strategies, … 1.2.06 was certainly [a focus] for the kids that were reading from the other trade books… *Interviewer:* Do you think that both [topics 1.2.03 and 1.2.06] apply to the students in the limited vocabulary? Or is this the [only] one you would choose… *Teacher:* I think they would both apply in the limited vocabulary books.	<u>*Sight words* (1.2.03)</u>. *Teachers' conception is consistent with researchers'*. The fact that the teacher explicitly mentioned that she had students read "limited vocabulary books" so that they would learn *sight words* is fairly strong evidence that she shared researchers' conception of this topic. <u>*Word reading strategies* (1.2.06)</u>. *Unable to determine teachers' conception of topic*. The teacher said she focused on reading strategies and integrated different strategies but did not mention nor describe specific strategies. This is suggestive, but not clear evidence that the teacher might share researchers' conception of the topic.

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 02, grades K & 1	*Teacher:* Okay, they had a choice time at the beginning of the day and there was a bingo game out that had *sight words*, so some of them were working on *sight words*. *Interviewer:* Okay, well, turning this over, [this first activity], it is just sort of like a bingo game. It is like words. *Teacher:* Yeah, *sight words*, 1.2.03 is what would go with that.	*Sight words* (1.2.03). *Teachers' conception is consistent with researchers'*. There is *strong evidence* that the teacher shares researchers' conception of the topic. The teacher explicitly mentioned that students worked on *sight words* as they played bingo.

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 02, grades K & 1	*Teacher:* And after lunch, they were working with *sight words*; they were playing some games with them. We play a game where there are words, words like "the sun" located on my wall too, and we play a game where "Guess my word?" and I'll say something like "Well, it is on the wall" and "Well, it begins with the letter 'L' " and I give them clues until they can finally come up with the word. They get five clues until they can figure it out, so we spent some time doing that. And then they write the word down, and we say it back and chant it back so we have a couple different ways to learn what that word is. *Interviewer:* Okay, we just have a few more here, and there was the *sight words*, guessing words. *Teacher:* Okay, that is what it is, is *sight words* recognition. *Interviewer:* Okay, 1.2.03	*Sight words* (1.2.03). *Teachers' conception is consistent with researchers'*. There is *strong evidence* that the teacher shares researchers' conception of the topic. The teacher explicitly mentioned that students worked on *sight words* as they played the "Guess my word" game. *Word reading strategies* (1.2.06). *Unable to determine teachers' understanding of topic*. The teacher described an activity which directs students to focus on initial consonants when reading words. Despite this description, the teacher did not report that this topic was taught. It is impossible to tell whether she simply omitted this topic from her topic reports or whether she did not share researchers' description of the topic label.

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 03, grades 2 & 3	*Teacher:* And so we are involved with the University of Chicago's junior Greek book series which takes unabridged collected works by Rudyard Kipling and Hans Christian Andersen and so they are some very advanced reading series. And they talked about Jack and the Beanstalk and the political ramifications of when that story was written and that was a read aloud in a small group. And then the third graders were reading "How the Camel Got his Hump," and talked about when that was written and that was also a read aloud and was very insightful for me to hear that they were understanding that people were constructing stories and how stories were constructed and the multiple layers of how a story might be constructed. We do that for an hour each day so the third graders have an hour of literature and then the second graders have an hour of literature and that's daily. *Interviewer:* And how about the reading series with Jack and the Beanstalk? *Teacher:* Okay. 1.1.02, 1.1.03, 1.2.01. *Interviewer:* We're on the reading series right now? *Teacher:* Yes, isn't that right? 1.20.3. 1.2.06. 1.3.01. Sorry. 1.3.02. 1.3.03. 1.3.04. 1.3.07. 1.3.06. Sorry I missed that one. Okay, that's it. *Interviewer:* Okay. And going on to How the Camel Got His Hump? *Teacher:* That would be the same.	*Sight words (1.2.03). Unable to determine teachers' understanding of topic* *Word reading strategies (1.2.06). Unable to determine teachers' understanding of topic* The teachers' description of classroom activity and content covered does give any indication about her conception of *sight words* or *word reading strategies*. She simply states that these topics were objectives of her reading lesson but did not describe how the topics were taught.

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 04, grades K & 1	*Teacher:* Another regular thing we do in the morning is our morning message. We might do phonics there, patterns in words, I'm getting them to look at lately – but that is a whole group activity, and they come up individually if the want to show us something they know on the morning message. And it's just like two lines I've written. It also gives them an idea of what we're going to do that morning, so it's kind of a preparation. *Interviewer:* Then you said you had the morning message where you were looking for patterns and words and things like that, so where would you say that would fit under? *Teacher:* Oh, a lot of different things, probably *word reading strategies*, 1.2.06. That covers quite a bit of things.	*Word reading strategies* (1.2.06) *Teachers' conception is consistent with researchers'*. The teachers' report that she had students look for "patterns in words" is suggestive that she might share researchers' conception of *word reading strategies*. In order to more definitively establish a shared conception, we would need to know more about what the teacher means by "patterns in words."

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 04, grades K & 1	*Teacher:* Right after lunch is an independent reading time, and they all read individually. I'll take one or two kids and read with them one to one. I have one boy who's really…I read with him more often because he's having a hard time. He's working on one-to-one correspondence words, you know, saying a word, because he understands getting meaning from pictures, and he's got the meaning part of it down, now he's sort of working on the visual and reading what is actually there. And he also then went on to work on the computer and this was his idea, to type in the book in the computer – you know, it's a real short book – but he worked on that again, he'd been working on it yesterday too, because he's very motivated to do it because it was his idea and he knows…he likes the book, and this is going to help him. And I just happened to have a copy of pictures from the book today too, so he was able to put them together today after reading time. *Interviewer:* So, the first thing I have is the independent reading time. So, I'm wondering where you would put that in. *Teacher:* Um, now each child had a little bit different purpose, cause some were working more on their strategies and others were reading for a variety of purposes. Put 1.2.06 and then put 3.06.	*Word reading strategies* (1.2.06) *Teachers' conception is consistent with researchers'.* The teachers' report of working with a student in using pictures as context clues suggests that her conception of *word reading strategies* aligns with researchers' conception.

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 05, grades K, 1 & 2	*Teacher:* Then we had half an hour of SSR *** this morning also, and that gave me an opportunity to read with about 4 children because I take that time to do book exchange. And what I have is a home lending program, so the children can take books they've selected from my classroom. …parents are very perplexed about why children are bringing home books that they can't read… So that gives me an opportunity during quiet reading to read with them. That's usually about four kids per day. *Interviewer:* What about the four children that you were reading with… *Teacher:* That I read with individually? I was looking for, I was looking for 1.2.02, I was looking for 1.2.03 and 1.2.06 in other words, if they wanted to continue reading the same kind of book we were reading, I need to make a decision if they were only going to become more frustrated or if I had to change what they were choosing.	*Sight words* (1.2.03) *Word reading strategies* (1.2.06). *Unable to determine teachers' understanding of topic.* Teacher 05's description suggests that she was "looking for" students' knowledge of *sight words* and their ability to use various reading strategies as she listened to them read. However, without a more explicit description, it is difficult to ascertain whether this was in fact what she did.

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 06, grades 3 & 4	*Teacher:* Yeah. Now I have two or three kids who go to special ed., but I'm not including them on here. Usually they go to special ed. during this independent language arts time so they are doing the same things. Instead of doing reading and writing, they are learning to read, learning to spell. You know, the special ed. program is more of a one-to-one specialized thing. *Interviewer:* And for your two special ed. students, what would you say the purpose of what they were doing was? *Teacher:* I think they are doing structural analysis. And I think they are doing these two things. *Interviewer:* 1.2.05 and .06. *[does teacher confirm this]?* *Teacher:* Because this sounds to me like they are really practicing reading words. One of them is a little bit ahead of the other, but I think this is what they go over. Maybe *sight words*.	*Sight words* (1.2.03). *Teachers' conception is consistent with researchers'.* Teacher 06's report that she worked on *sight words* with these 2 students seems fairly unambiguous. *Word reading strategies* (1.2.06). *Unable to determine teachers' understanding of topic.*

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 08, grades K-5	*Teacher*: We've been working with a computer software program created by Tom Snyder productions called Neighborhood Map Machine. Basically, you can create maps with it. But the part that has been very engaging for kids is a part called mystery, where you basically hide some kind of object in the map somewhere, and they have to go through a series of clues to find it. So, the reading part, they have to read the clues. And that's been a problem with 1st and 2nd grade because some of the language is tough for them, but we do have the option with the program to record voice, and I'm in the process of doing that now, so all the written clues will have an audio part as well, so it's fun. *Interviewer:* Here I'd like to start with the clues, the reading of the clues in mystery and where you think that would fall in here. *Teacher:* 1.2.03, 1.2.06 is a possibility, 1.3.01, I guess, 1.3.06, the variety of purposes…you have to read for and listen for, and some of them too do come with audio prompts, so I guess 1.3.07 would fit in there. Probably most of it, some of these are general enough that if I really wanted to stretch it I probably could add another…	*Sight words* (1.2.03). *Teachers' conception is consistent with researchers' – suggestive.* That is, if students had to read words to play computer game and teacher says *sight words* were covered, there's a pretty good chance that students worked on *sight words* while playing the computer game. *Word reading strategies* (1.2.06). *Unable to determine teachers' understanding of topic.*

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 08, grades K-5	*Teacher:* There's a group of 5th graders at 2:50 to 3:30 that [were] doing some research on states, specific states in the US, and they are going to do a computer presentation program with it. *Interviewer:* So you'd say this is a reading activity? *Teacher:* That's a reading activity. Yeah, that's kind of a short term project *Interviewer:* How about when you had the group of students who were working on the research on the states, and where do you think the topics that you'd have in there? *Teacher:* 1.2.06, 1.3.02, 1.3.06, course they're doing a little writing too…do you want me to go on with this written part?	*Word reading strategies* (1.2.06). *Teachers' conception is inconsistent with researchers'*. It seems unlikely that fifth grade students would work on *word reading strategies* as this really is a focal area for early readers. Therefore it seems likely that the teacher had something different in mind that the researchers' conception when she reported this topic.

Teacher	Evidence of Teachers' Conceptions of Topics	Analysis
Teacher 11, grade 3	*Teacher:* And then being the kind of community this school is, we have a kindergarten class who comes in every Wednesday for reading buddies and my kids have a partner in kindergarten and they helped listen to the kindergartners read. *Interviewer:* And thinking about the reading buddies, let's pick out the topics that are appropriate. *Teacher:* Pre-reading comes in, all these subcategories under 1.1 and 1.2. My children were working with the kindergartners. We had given them a sort of mini-training so they were working with the kindergartners on how to figure out what a word is by looking at the picture. Not only by looking at the picture, but context clues and hints, and beginning letter sounds so a lot of these subcategories they were working not necessarily for themselves but to help the kindergartners pick it up. So I'd say print concepts 1.1.01. 1.1.02. 1.1.03. 1.2.01. 1.2.02. 1.2.03 *sight words*. Not this one because I don't think it had much to do with conventional spelling so we'll skip .04, and not with the kindergartners so I'd stop there. Oh, wait. 1.2.06 *word reading strategies* like picture and context clues so they were pointing to pictures and having the kindergartners say "bicycle" so the word is "bicycle." So it was with picture word. *Interviewer:* So 1.2.06? That's helpful. I'm glad we caught that. *Teacher:* It wasn't for themselves they were learning it, but I think that especially some of my lower readers who are frustrated and who think they can't read, when they see how they were teaching the kindergartners, it helps them too.	*Sight words (1.2.03). Teachers' conception is consistent with researchers'.* Teacher 11 said explicitly that the kindergarten students worked on *sight words*. *Word reading strategies (1.2.06). Teachers' conception is consistent with researchers'.* The fact that teacher 11 explicitly describes the use of pictures as context clues when reading words indicates that she shares the researchers' conception of this topic.